federal register

FRIDAY, JULY 2, 1971
WASHINGTON, D.C.
Volume 36 ▪ Number 128

PART II

ENVIRONMENTAL PROTECTION AGENCY

▪

Exhaust Emission Standards and Test Procedures

Title 45—PUBLIC WELFARE

Chapter XII—Environmental Protection Agency

PART 1201—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Oxides of Nitrogen Exhaust Emission Standard and Test Procedures

On February 27, 1971, a notice of proposed rule making was published in the FEDERAL REGISTER (36 F.R. 3825) which set out the text of proposed amendments to the regulations in this part to provide for an oxides of nitrogen exhaust emission standard and test procedures to become applicable to new light duty vehicles beginning with the 1973 model year.

Pursuant to the above notice, a number of comments have been received from representatives of domestic and foreign manufacturers and from other interested parties. Due consideration has been given to all relevant matter presented and a number of amendments have been made to the regulations as proposed.

Changes have been made to the proposed regulations to provide for a better description of the NO_2 converter, a method of determining the efficiency of the NO_2 converter, and an NO_x background level correction factor. The special allowance for off-road utility vehicles had been extended to cover NO_x as well as hydrocarbons and carbon monoxide.

In addition, the final rule contains other amendments, largely technical and clarifying modifications.

The oxides of nitrogen exhaust emission standard, as proposed for the 1975 model year, is not included in these regulations but is included in the final rule for exhaust emission standards applicable to 1975 and later model years (proposed in 36 F.R. 3528 and 36 F.R. 9469).

The amendments to Part 1201 set forth below are hereby adopted effective on publication in the FEDERAL REGISTER (7–2–71) and are applicable to new light duty vehicles beginning with the 1973 model year.

The current regulations which appear at Part 1201 will remain in effect for the purpose of their applicability to earlier model year vehicles.

(Sec. 301(a), 81 Stat. 504; 42 U.S.C. 1857g (a), as amended by sec. 15(c)(2), Public Law 91-604, 84 Stat. 1713)

Dated: June 23, 1971.

WILLIAM D. RUCKELSHAUS,
Administrator.

Part 1201 of Chapter XII, Title 45 of the Code of Federal Regulations is amended as follows:

1. In § 1201.1 a new subparagraph is added as follows:

§ 1201.1 Definitions.

(a) * * *

(32) "Oxides of Nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

2. In § 1201.2 four new abbreviations are added as follows:

§ 1201.2 Abbreviations.

* * * * *

C.—Centigrade.
NO—Nitric Oxide.
NO_2—Nitrogen Dioxide.
NO_x—Oxides of Nitrogen.

* * * * *

3. In § 1201.21, paragraph (a) is revised to read as follows:

§ 1201.21 Standards for exhaust emissions.

(a) Exhaust emissions from 1973 and 1974 model year vehicles shall not exceed:

(1) Hydrocarbons—3.4 grams per vehicle mile.

(2) Carbon monoxide—39.0 grams per vehicle mile.

(3) Oxides of nitrogen—3.0 grams per vehicle mile.

* * * * *

4. In § 1201.70, paragraph (b) is revised to read as follows:

§ 1201.70 Introduction.

* * * * *

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles from a cold start. The test consists of engine startup and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix A to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

* * * * *

5. In § 1201.74, paragraph (b)(1) is revised to read as follows:

§ 1201.74 Evaporative emission collection procedure.

* * * * *

(b) *Running loss test.* (1) The vehicle shall be placed on the dynamometer and the fuel tank thermocouple reconnected. The fuel temperature and the ambient air temperature shall be recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

* * * * *

6. In § 1201.75, paragraph (b) is revised to read as follows:

§ 1201.75 Dynamometer driving schedule.

* * * * *

(b) A speed tolerance of ±2 m.p.h. and a time tolerance of ±1 second (or an algebraic combination of the two) from either the speed-time relationship prescribed in Appendix A or as printed on a driver's aid chart approved by the Administrator are acceptable. Speed tolerances greater than 2 m.p.h. (such as occur when shifting manual transmission vehicles) are acceptable provided they occur for less than 2 seconds on any one occasion. Speeds lower than those prevehicle is operated at maximum available power during such occurrences. Further, speed deviations from those prescribed due to stalling are acceptable provided the provisions of § 1201.80(f) are adhered to.

7. In § 1201.76, paragraph (a) is revised to read as follows:

§ 1201.76 Dynamometer procedure.

(a) The vehicle shall be tested from a cold start. Engine startup and operation over the driving schedule make a complete test run. Exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during the entire test run. The composite sample, collected in a bag, is analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen emissions. A parallel sample of the dilution air is similarly analyzed.

* * * * *

8. In § 1201.80, paragraphs (a) and (b)(1) are revised to read as follows:

§ 1201.80 Engine starting and restarting.

(a) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20-second-idle period shall begin when the engine starts.

(b) Choke operation:

(1) Vehicles equipped with automatic chokes shall be operated according to the manufacturer's operating or owner's manual including choke setting and "kick-down" from cold fast idle. If choke "kick-down" time is not specified, it shall be performed 13 seconds after the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

* * * * *

9. Section 1201.81 is revised to read as follows:

§ 1201.81 Sampling and analytical system (exhaust emissions).

(a) *Schematic drawings.* The following figures (Figs. 1a and 1b) are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations

in this part. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

In particular, the HC and CO instruments may be connected in series instead of in parallel.

(b) *Component description (exhaust gas sampling system).* The following components will be used in the exhaust gas sampling system for testing under the regulations in this part. See Figure 1a. Other types of constant volume samplers may be used if shown to yield equivalent results.

(1) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream. The filters shall be of sufficient capacity and the duct which carries the dilution air to the point where the exhaust gas is added shall be of sufficient size so that the pressure at the mixing point is less than 1 inch of water pressure below ambient when the constant volume sampler is operating at its maximum flow rate.

(2) A flexible, leak-tight connector and tube to the vehicle tailpipe. The flexible tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±1 inch of water of the static pressure variations measured during a dynamometer driving cycle with no connections to the tailpipe(s).

(3) A heating system to preheat the heat exchanger to within ±10° F. of its operating temperature before the test begins.

(4) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10° F. as measured at a point immediately ahead of the positive displacement pump.

(5) A positive displacement pump to pump the dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix C for flow calibration techniques.

(6) Temperature sensor (T1) with an accuracy of ±2° F. to allow continuous recording of the temperatures of the dilute exhaust mixture entering the positive displacement pump. (see § 1201.83 (1)).

(7) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(8) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(9) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution air stream and the dilute exhaust mixture. Additional sample probes may be used, for example, to obtain continuous concentration traces of the dilute exhaust stream. In such case the sample flow rate, in standard cubic feet per test, must be added to the calculated dilute exhaust volume. The position of the sample probe in Figure 1a is pictorial only.

(10) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples prior to entering sample collection bags.

(11) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(12) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 5 c.f.h.

(13) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(14) Three-way solenoid valves (V1 and V2) to direct sample streams to either their respective bags or overboard.

(15) Quick-connect leak-tight fittings (C1 and C2), with automatic shutoff on bag side, to attach sample bags to sample system.

(16) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(17) A revolution counter to count the revolutions of the positive displacement pump while the test is in progress and samples are being collected.

(c) *Component description (exhaust gas analytical system).* The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentration by chemiluminescence (C1) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. See Appendix E. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure 1b.

(1) Quick-connect leak-tight fitting (C3) to attach sample bags to analytical system.

(2) Filter (F3) to remove any residual particulate matter from the collected samples.

(3) Pump (P3) to transfer samples from the sample bags to the analyzers.

(4) Selector valves (V3, V4, and V5) for directing samples, span gases or zeroing gas to the analyzers.

(5) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, and N11) to regulate the gas flow rates.

(6) Flowmeters (FL3, FL4, and FL5) to indicate gas flow rates.

(7) Manifold (M1) to collect the expelled gases from the analyzers.

(8) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(9) Analyzers to determine hydrocarbon, carbon monoxide and oxides of nitrogen concentrations.

(10) An oxides of nitrogen converter to convert any NO_2 present in the samples to NO before analysis.

(11) Selector valves (V6 and V7) to allow the sample, span, calibrating or zeroing gases to bypass the converter.

(12) Recorders (R1, R2, and R3) to provide permanent records of calibration, spanning and sample measurements.

10. Figures 1a and 1b of § 1201.81 are revised as follows:

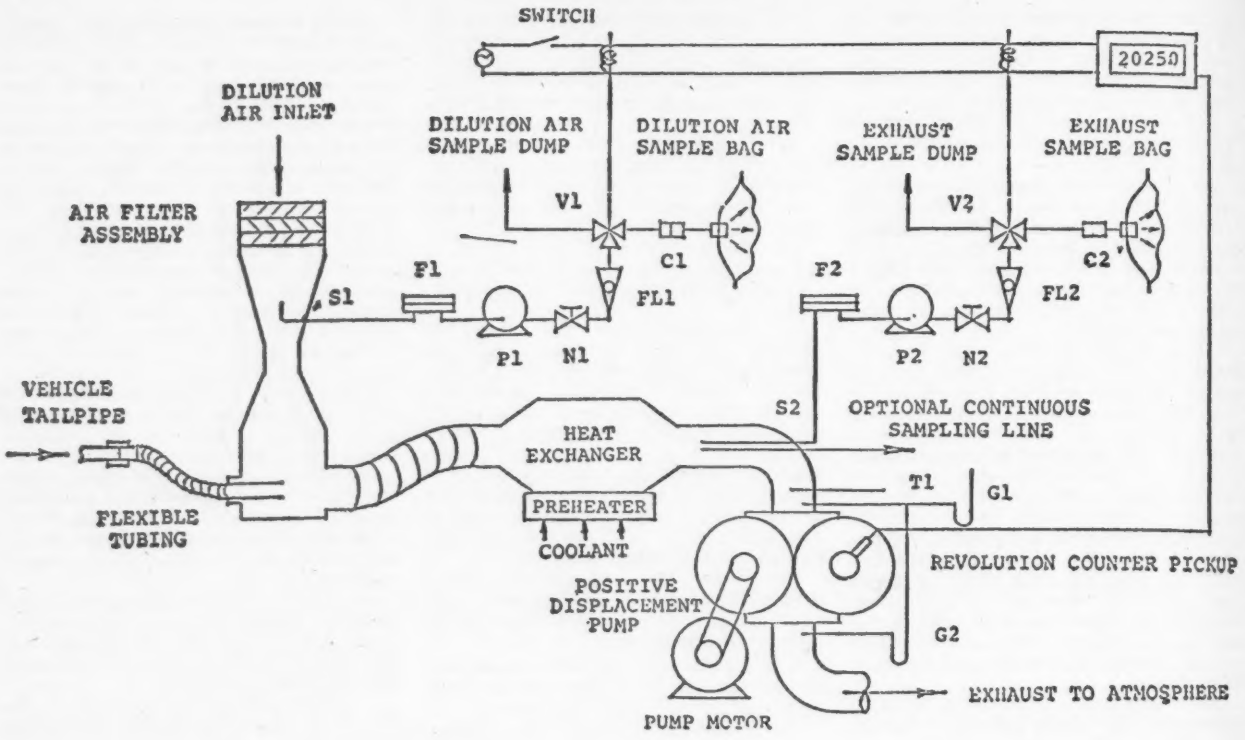


Figure 1a. Exhaust Gas Sampling System

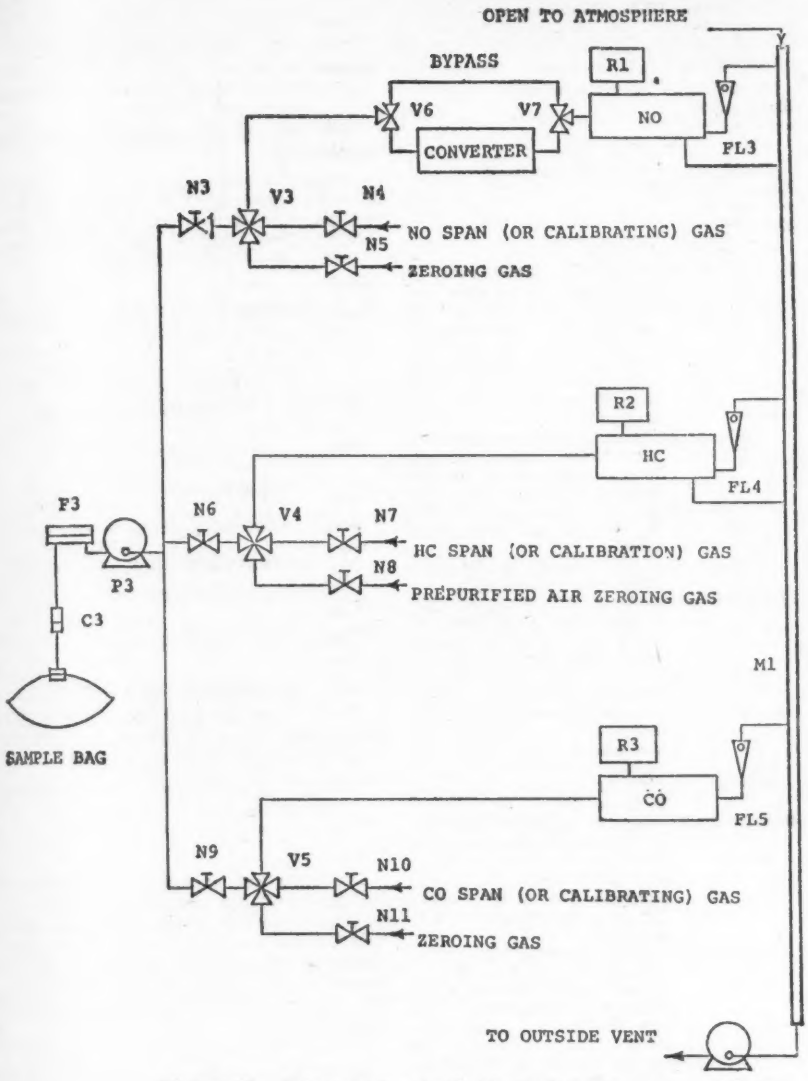


Figure 1b. Exhaust Gas Analytical System

§ 1201.83 [Amended]

11. In § 1201.83, the number "+5°" in paragraph (e) is revised to read "±5°".

12. Section 1201.84 is revised and a new Figure 1c is added as follows:

§ 1201.84 Analytical system calibration and sample handling.

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air and the carbon monoxide and oxides of nitrogen analyzers with either zero grade air or nitrogen. The allowable zero gas impurity concentrations should not exceed 1 p.p.m. equivalent carbon response, 1 p.p.m. carbon monoxide, and 0.1 p.p.m. nitric oxide.

(3) Set the CO analyzer gain to give the desired range. Select desired attenuation scale of the HC analyzer and set the sample capillary flow rate, by adjusting the back pressure regulator, to give the desired range. Select the desired scale of the NO_x analyzer and adjust the phototube high voltage supply to give the desired range. The operating range of the analyzers shall be such that the analyzer deflection which indicates an emission level equivalent to the respective standard is in the upper two-thirds of the scale.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations of 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the NO_x analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO analyzer with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgment in selecting curves for data reduction.

(6) Check the NO_x to NO converter efficiency by the following procedure:

(i) Fill a sample bag (one not previously used to collect exhaust gas samples) with air (or oxygen) and NO span gas in proportions which result in a mix in the operating range of the analyzer. Provide enough oxygen for substantial conversion of NO to NO_2.

(ii) Knead bag and immediately connect the bag to the sample inlet and alternately measure the NO and NO_x concentration at 1-minute intervals by alternately passing the sample through the converter and the bypass (close valves N8 and N9 to minimize pump down rate of bag). After several minutes of operation, the recording of NO and NO_x will resemble Figure 1c if the converter is efficient. Even though the amount of NO_2 increases with time, the total NO_x($NO+NO_2$) remains constant. A decay of NO_x with time indicates the converter is not essentially 100 percent efficient and the cause should be determined before the instrument is used.

(iii) The converter efficiency should be checked at least once weekly and preferably once daily.

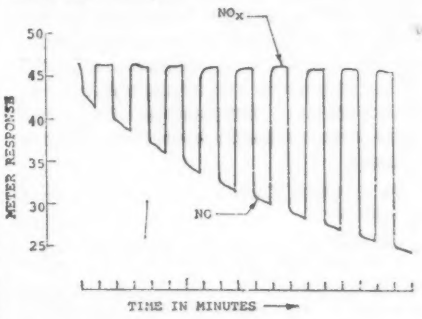


Figure 1c. Converter Efficiency Check Response

(b) HC, CO, and NO_x measurements: Allow a minmum of 20 minutes warmup for the HC analyzer and 2 hours for the CO and NO_x analyzers. (Power is normally left on infrared and chemiluminescence analyzers; but when not in use,

the chopper motor of the infrared analyzer is turned off and the phototube high voltage supply of the chemiluminescence analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after test.

(2) Introduce span gases and set the CO analyzer gain, the HC analyzer sample capillary flow rate and the NO_x analyzer high voltage supply to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO analyzer, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeroes; repeat the procedure in subparagraphs (1) and (2) of this paragraph if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, and NO_x concentrations of samples. Prevent moisture from condensing in the sample collection bag.

(6) Check zero and span points.

(c) For the purposes of this paragraph, the term "zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

13. Section 1201.86 is revised to read as follows:

§ 1201.86 Chart reading.

(a) Determine the HC, CO, and NO_x concentrations of the dilution air and dilute exhaust sample bags from the instrument deflection or recordings making use of appropriate calibration charts.

(b) Determine the average dilute exhaust mixture temperature from the temperature recorder trace if a recorder is used.

14. Section 1201.87 is revised to read as follows:

§ 1201.87 Calculations (exhaust emissions).

The final reported test results shall be computed by use of the following formulae:

(a) For light duty vehicles, excluding off-road utility vehicles:

(1) Hydrocarbon Mass:

$$HC_{mass} = V_{mix} \times Density_{HC} \times \frac{HC_{conc}}{1{,}000{,}000}$$

(2) Carbon Monoxide Mass:

$$CO_{mass} = V_{mix} \times Density_{CO} \times \frac{CO_{conc}}{100}.$$

(3) Oxides of Nitrogen Mass:

$$NOx_{mass} = V_{mix} \times Density_{NO_2} \times \frac{NOx_{conc}}{1{,}000{,}000}$$

(b) For off-road utility vehicles:

(1) $HC_{mass} = V_{mix} \times Density_{HC} \times \frac{HC_{conc} \times 0.85}{1{,}000{,}000}$.

(2) $CO_{mass} = V_{mix} \times Density_{CO} \times \frac{CO_{conc} \times 0.85}{100}$.

(3) $NOx_{mass} = V_{mix} \times Density_{NO_2} \times \frac{NOx_{conc} \times 0.85 \times K_H}{1{,}000{,}000}$

(c) Meaning of symbols:

HC_{mass} = Hydrocarbon emissions, in grams per vehicle mile.

$Density_{HC}$ = Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (16.33 gm./cu. ft.).

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample minus hydrocarbon concentration of the dilution air sample, in p.p.m. carbon equivalent i.e., equiavlent propane × 3.

CO_{mass} = Carbon monoxide emissions, in grams per vehicle mile.

$Density_{CO}$ = Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 gm./cu. ft.).

CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample minus the carbon monoxide concentration of the dilution air sample, in volume percent.

NOx_{mass} = Oxides of nitrogen emissions, in grams per vehicle mile.

$Density_{NO_2}$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (54.16 gm./cu. ft.).

NOx_{conc} = Oxides of nitrogen concentration of the dilute exhaust sample minus the oxides of nitrogen concentration of the dilution air sample, in p.p.m.

V_{mix} = Total dilute exhaust volume in cubic feet per mile, corrected to standard conditions (528°R and 760 mm. Hg).

$$V_{mix} = K_1 \times V_o \times N \times \frac{P_p}{T_p}$$

where:

$$K_1 = \frac{528°R}{760 \text{ mm. Hg} \times 7.5 \text{ miles}} = 0.09263.$$

V_o = Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test while samples are being collected.

P_p = Absolute pressure of the dilute exhaust entering the positive displacement pump, in mm. Hg, i.e., barometric pressure minus the pressure depression below atmospheric of the mixture entering the positive displacement pump.

T_p = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

K_H = Humidity correction factor.

$$K_H = \frac{1}{1 - 0.0047\,(H - 75)}$$

where:

H = Absolute humidity in grains of water per pound of dry air.

(d) Example calculation of mass emission values:

Assume $V_o = 0.265$ cu. ft. per revolution; $N = 20{,}250$ revolutions; $H = 85$ grains per lb. of dry air; $P_p = 730$ mm. Hg; $T_p = 550°R$; $HC_{conc} = 160$ p.p.m. carbon equivalent; $CO_{conc} = 0.09\%$; and $NOx_{conc} = 70$ p.p.m.

Then:

$V_{mix} = (0.09263)\ (0.265)\ (20{,}250)\ (730/550) = 659.8$ cu. ft. per mile.

$$K_H = \frac{1}{1 - 0.0047\,(85 - 75)} = 1.049.$$

(1) For a 1972 light-duty vehicle.

$$HC_{mass} = 659.8 \times 16.33 \times \frac{160}{1{,}000{,}000} = 1.72 \text{ grams per vehicle mile.}$$

$$NOx_{mass} = 659.8 \times 54.16 \times \frac{70}{1{,}000{,}000} \times 1.049 = 2.62 \text{ grams per vehicle mile.}$$

(2) For a 1972 utility vehicle.

$$CO_{mass} = 659.8 \times 32.97 \times \frac{0.09 \times 0.85}{100} = 16.6 \text{ grams per vehicle mile.}$$

15. In § 1201.92, the second sentence of paragraph (c) (1) is revised. As amended, § 1201.92(c) (1) reads as follows:

§ 1201.92 Compliance with emission standards.

* * * * *

(c) * * *

(1) Separate emission deterioration factors shall be determined from the emissions results of the durability data vehicles for each engine-system combination. A separate factor shall be established for the combination for exhaust HC, exhaust CO, exhaust NO_x, and fuel evaporative HC.

* * * * *

16. A new appendix, Appendix E, is added as follows:

APPENDIX E—OXIDES OF NITROGEN ANALYTICAL SYSTEM

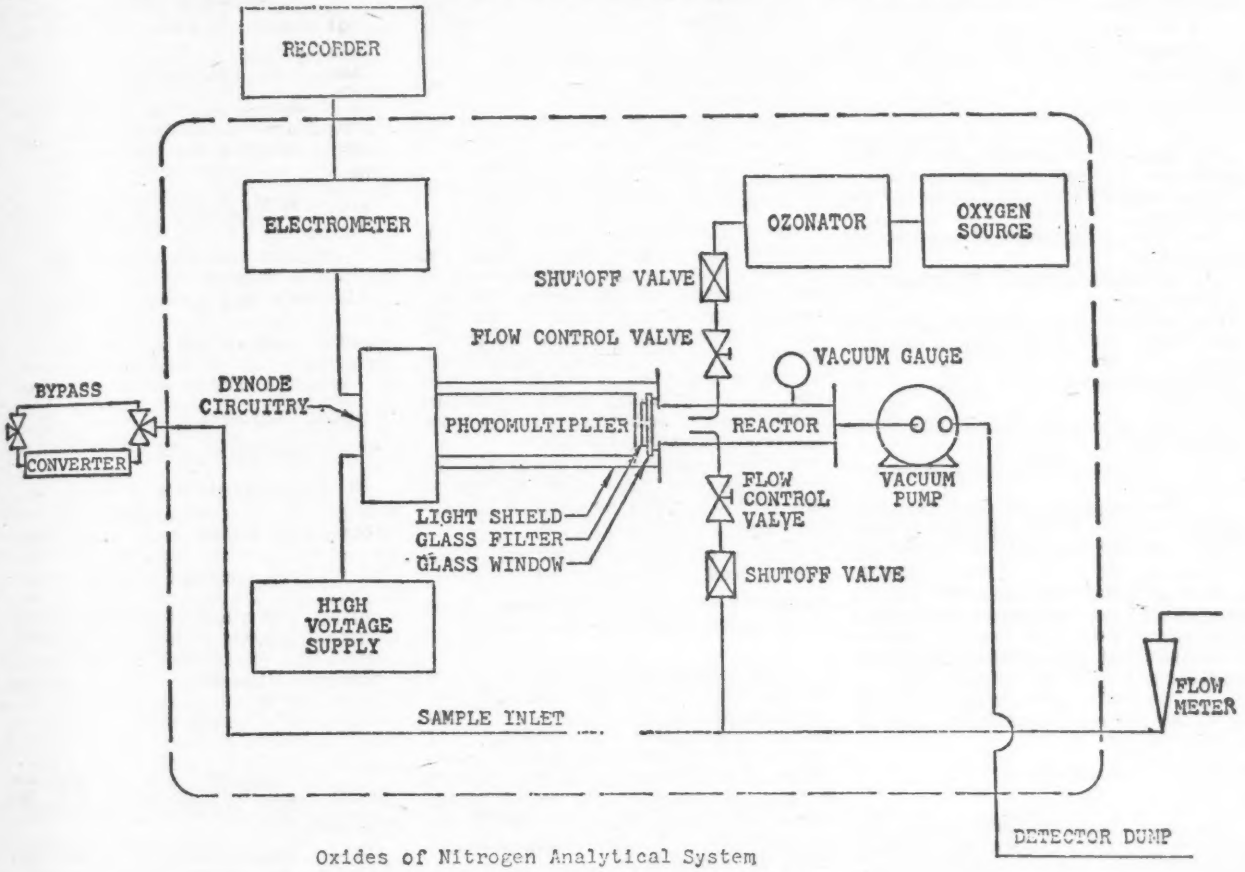
The chemiluminescence method utilizes the principle that nitric oxide (NO) reacts with ozone (O_3) to give nitrogen dioxide (NO_2) and oxygen (O_2). Approximately 10 percent of the NO_2 is electronically excited. The transition of excited NO_2 to the ground state yields a detectable light emission (590-630 nanometer region) at low pressures. The intensity of this emission is proportional to the mass flow rate of NO into the reactor. The light emission can be measured utilizing a photomultiplier tube and associated electronics.

The method also utilizes the principle that the thermal decomposition of NO_2 ($2NO_2 \rightarrow 2NO + O_2$) is complete at about 600° C. The rate of constant for the dissociation of NO_2 at 600° C. is approximately 10^6 (liters/mole-second). A 6-foot length of one-eighth inch outside diameter, 0.028 wall thickness, flawless stainless steel tubing resistance heated using a low voltage, high current power supply to a temperature of 650° C. (1200° F.) provides sufficient residence time at a sample flow rate of 700 cc. per minute (1.5 c.f.h.) for essentially complete conversion of nitrogen dioxide to nitric oxide. Other converter

designs may be used if shown to yield essentially 100 percent conversion of NO_2 to NO.

The method permits continuous monitoring of NO_x concentrations over a wide range. Response time (2 to 4 seconds is typical) is primarily dependent on the mechanical pumping rate at the operating pressure of the reactor. The operating pressure of the reactor is generally less than 5 torr.

The following figure is a flow schematic illustrating one configuration of the major components required for the oxides of nitrogen analytical system.



Oxides of Nitrogen Analytical System

[FR Doc.71-9307 Filed 7-1-71;8:45 am]

PART 1201—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Exhaust Emission Standards Applicable to 1975 and Later Model Year Light Duty Vehicles

On February 26, 1971, a notice of proposed rule making was published (36 F.R. 3528) which set out the text of proposed amendments to the regulations in this part to provide for more stringent exhaust emission standards for hydrocarbons and carbon monoxide to become applicable to new light duty vehicles beginning with the 1975 model year. On May 25, 1971, a notice of proposed rule making was published (36 F.R. 9469) which proposed a more stringent exhaust emission standard for oxides of nitrogen to become applicable to such vehicles beginning with the 1976 model year.

Pursuant to the above notices, a number of comments have been received from representatives of domestic and foreign manufacturers and from other interested parties. Due consideration has been given to all relevant matter presented, and a number of amendments have been made to the regulations as proposed.

Based upon air quality data, the test procedures have been modified to include both hot and cold start tests which are then weighted to better represent emissions that should be measured to meet air quality requirements. In addition, some modifications have been made to the analytical system for carbon monoxide and a procedure has been established to determine and compensate for dilution air background levels. Further, since it is anticipated that lead-free gasoline will be generally available by July 1, 1974 (see the advance notice of proposed rule making on this subject in 36 F.R. 1486) the fuel specifications have been revised to provide for use of lead-free gasoline as a test fuel.

In addition, the final rule contains other amendments, largely technical and clarifying modifications. These regulations also include the oxides of nitrogen exhaust emission standard proposed for the 1975 model year in 36 F.R. 3825.

The amendments to Part 1201 set forth below are hereby adopted effective on publication in the FEDERAL REGISTER (7-2-71) and are applicable to new light duty vehicles beginning with the 1975 model year.

The current regulations which appear at Part 1201 will remain in effect for the purpose of their applicability to earlier model year vehicles.

(Sec. 6, Public Law 91-604; 84 Stat. 1690)

Dated: June 23, 1971.

WILLIAM D. RUCKELSHAUS,
Administrator.

Part 1201 of Chapter XII, Title 45 of the Code of Regulations is amended as follows:

1. In § 1201.1, paragraph (a) (3) is revised as follows:

§ 1201.1 Definitions.

(a) * * *

(3) "Model year" means the manufacturer's annual production period (as

determined by the Administrator) which includes January 1 of such calender year: *Provided,* That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

* * * * *

2. Section 1201.21 is revised to read as follows:

§ 1201.21 Standards for exhaust emissions.

(a) Exhaust emissions from 1975 model year vehicles shall not exceed:

(1) Hydrocarbons—0.41 gram per vehicle mile.

(2) Carbon monoxide—3.4 grams per vehicle mile.

(3) Oxides of nitrogen—3.0 grams per vehicle mile.

(b) Exhaust emissions from 1976 and later model year vehicles shall not exceed:

(1) Hydrocarbons—0.41 gram per vehicle mile.

(2) Carbon monoxide—3.4 grams per vehicle mile.

(3) Oxides of nitrogen—0.4 gram per vehicle mile.

(c) The standards set forth in paragraphs (a) and (b) of this section refer to the exhaust emitted over a driving schedule as set forth in the applicable sections of "Test Procedures for Vehicle Exhaust and Fuel Evaporative Emissions (Gasoline Fueled Light Duty Vehicles)" of this part and measured and calculated in accordance with those procedures.

3. In § 1201.70, paragraphs (b) and (c)(2) are revised. As amended, § 1201.70 reads as follows:

§ 1201.70 Introduction.

* * * * *

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix A to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

(c) * * *

(2) Running losses from the fuel tank and carburetor resulting from a simulated trip on a chassis dynamometer; and

* * * * *

4. Section 1201.71 is revised to read as follows:

§ 1201.71 Gasoline specifications.

(a) Fuel having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used in exhaust and evaporative emission testing. The lead content and octane rating of the fuel shall be in the range recommended by the vehicle or engine manufacturer.

Item	ASTM designation	Specifications
Distillation range	D 86	
IBP, ° F		75–95
10 percent point, ° F		120–135
50 percent point, ° F		200–230
90 percent point, ° F		300–325
EP, ° F (max.)		415
Sulfur, wt. percent, max	D 1266	0.10
Phosphorous, theory		0.0
RVP,[1] lb	D 323	8.7–9.2
Hydrocarbon composition	D 1319	
Olefins, percent, max		10
Aromatics, percent, max		35
Saturates		Remainder

[1] For testing which is unrelated to fuel evaporative emission control, the specified range is 8.0–9.2.

(b) Fuels representative of commercial fuels which will generally be available through retail outlets shall be used in mileage accumulation. The lead content and octane rating of the fuel used shall be in the range recommended by the vehicle or engine manufacturer. The Reid Vapor Pressure of the fuel used shall be characteristic of the motor fuel during the season during which the mileage accumulation takes place.

(c) The specification range of the fuels to be used under paragraph (b) of this section shall be reported in accordance with § 1201.51(b)(3).

5. In § 1201.73, paragraph (c) is revised to read as follows:

§ 1201.73 Vehicle preconditioning (fuel evaporative emissions).

* * * * *

(c) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 1201.75–1201.80 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. During the run the ambient temperature shall be between 68° F. and 86° F.

* * * * *

6. In § 1201.76, paragraph (a) is revised and a new paragraph (i) is added. As amended § 1201.76 reads as follows:

§ 1201.76 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour soak according to the provisions of §§ 1201.73–1201.74, and a "hot" start test with a 10-minute soak between the two tests. Engine startup, operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during each test. The composite samples collected in bags are analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen.

* * * * *

(i) If the dynamometer has not been operated during the 2-hour period immediately preceding the test it shall be warmed up for 15 minutes by operating it at 30 m.p.h. using a nontest vehicle.

7. Section § 1201.81 is revised to read as follows:

§ 1201.81 Sampling and analytical system (exhaust emissions).

(a) *Schematic drawings.* The following figures (Figs. 1a and 1b) are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Component description (exhaust gas sampling system).* The following components will be used in the exhaust gas sampling system for testing under the regulations in this part. See Figure 1a. Other types of constant volume samplers may be used if shown to yield equivalent results.

(1) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream. The filters shall be of sufficient capacity and the duct which carries the dilution air to the point where the exhaust gas is added shall be of sufficient size so that the pressure at the mixing point is less than 1 inch of water pressure below ambient when the constant volume sampler is operating at its maximum flow rate.

(2) A flexible, leak-tight connector and tube to the vehicle tailpipe. The flexible tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±1 inch of water of the static pressure variations measured during a dynamometer driving cycle with no connections to the tailpipe(s).

(3) A heating system to preheat the heat exchanger to within ±10° F. of its operating temperature before the test begins.

(4) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10° F. as measured at a point immediately ahead of the positive displacement pump.

(5) A positive displacement pump to pumps dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix C for flow calibration techniques.

(6) Temperature sensor (T1) with an accuracy of ±2° F. to allow continuous recording of the temperature of the

dilute exhaust mixture entering the positive displacement pump. (See § 1201.83 (1).)

(7) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(8) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(9) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution air stream and the dilute exhaust mixture. Additional sample probes may be used, for example, to obtain continuous concentration traces of the dilute exhaust stream. In such case the sample flow rate, in standard cubic feet per test phase, must be added to the calculated dilute exhaust volume. The position of the sample probe in Figure 1a is pictorial only.

(10) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples prior to entering sample collection bags.

(11) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(12) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(13) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(14) Three-way solenoid valves (V1, V2, and V3) to direct sample streams to either their respective bags or overboard.

(15) Quick-connect leak-tight fittings (C1, C2, and C3), with automatic shut-off on bag side, to attach sample bags to sample system.

(16) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(17) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(c) *Component description (exhaust gas analytical system).* The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide and carbon dioxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentrations by chemiluminescence (CL) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. See Appendix E. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure 1b.

(1) Quick-connect leak-tight fitting (C4) to attach sample bags to analytical system.

(2) Filter (F3) to remove any residual particulate matter from the collected sample.

(3) Pump (P3) to transfer samples from the sample bags to the analyzers.

(4) Selector valves (V4, V5, V6, V7, and V8) for directing samples, span gases or zeroing gases to the analyzers.

(5) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, and N13) to regulate the gas flow rates.

(6) Flowmeters (FL3, FL4, and FL5) to indicate gas flow rates.

(7) Manifold (M1) to collect the expelled gases from the analyzers.

(8) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(9) Analyzers to determine hydrocarbon, carbon monoxide, carbon dioxide and oxides of nitrogen concentrations.

(10) An oxides of nitrogen converter to convert any NO_2 present in the samples to NO before analysis.

(11) Selector valves (V9 and V10) to allow the sample, span, calibrating or zeroing gases to bypass the converter.

(12) Water trap (T1) to partially remove water and a valve (V11) to allow the trap to be drained.

(13) Sample conditioning columns to remove remainder of water (WR1 and WR2 containing indicating $CaSO_4$) and carbon dioxide (CDR1 and CDR2 containing ascarite) from the CO analysis stream.

(14) Selector valves (V12 and V13) to permit switching from exhausted absorbing columns to fresh columns.

(15) Water bubbler (W1) to allow saturation of the CO_2 span gas to check efficiency of absorbing columns.

(16) Recorders (R1, R2, R3, and R4) to provide permanent records of calibration, spanning and sample measurements.

* * * * *

8. In § 1201.81, Figures 1a and 1b are revised as follows:

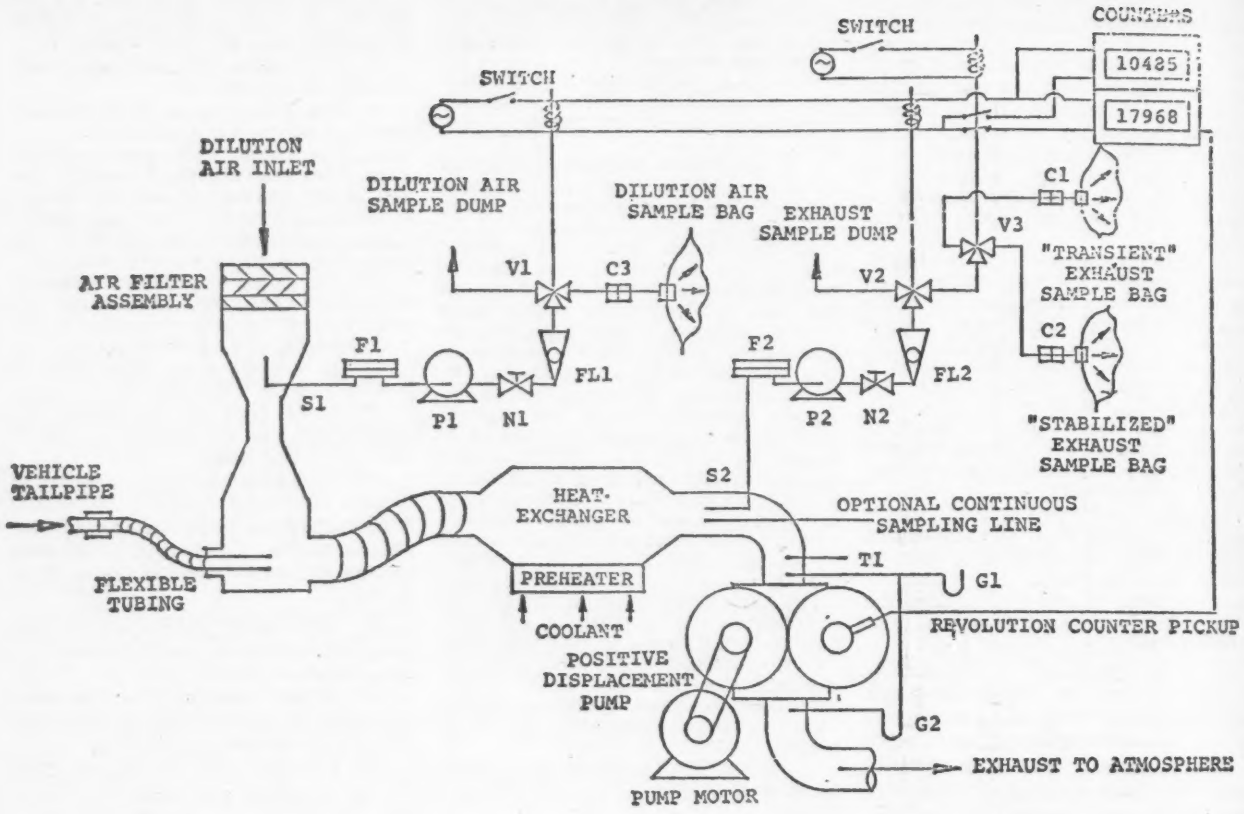


Figure 1a. Exhaust Gas Sampling System

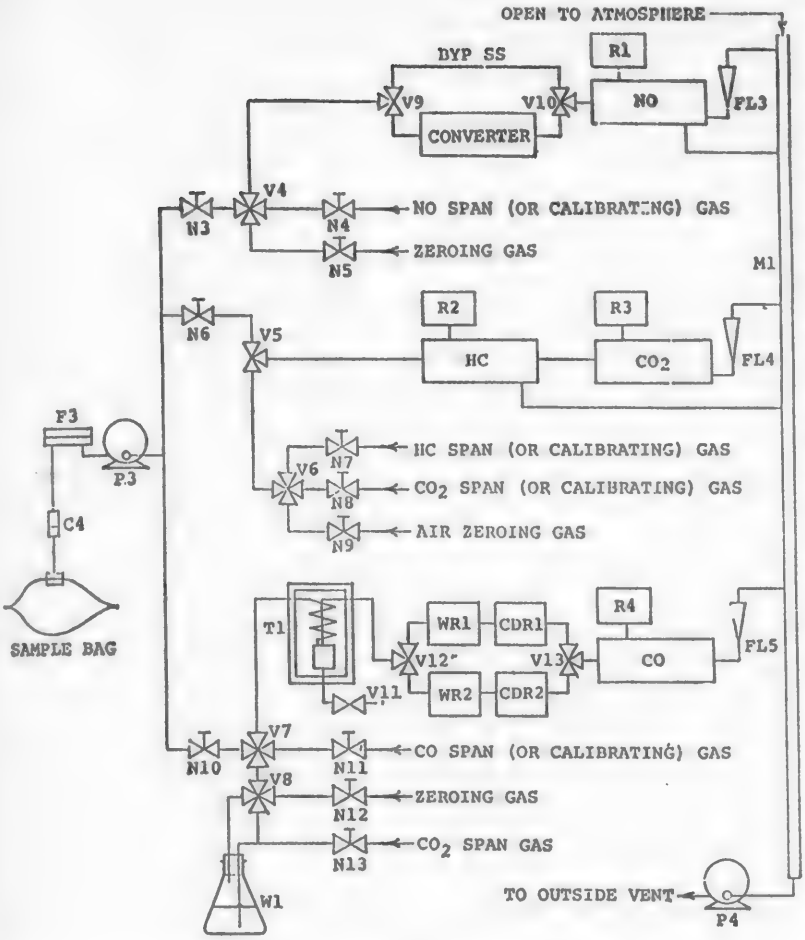


Figure 1b. Exhaust Gas Analytical System

9. In § 1201.83, a new paragraph (n) is added as follows:

§ 1201.83 Information to be recorded.

* * * * *

(n) The humidity of the dilution air.

* * * * *

10. Section 1201.84 is revised to read as follows:

§ 1201.84 Analytical system calibration and sample handling.

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air and the carbon monoxide, carbon dioxide, and oxides of nitrogen analyzers with zero grade nitrogen. The allowable zero gas impurity concentrations should not exceed 1 p.p.m. equivalent carbon response, 1 p.p.m. carbon monoxide, 300 p.p.m. (0.03 mole percent) carbon dioxide, and 0.1 p.p.m. nitric oxide.

(3) Set the CO and CO_2 analyzer gains to give the desired ranges. Select the desired attenuation scale of the HC analyzer and set the sample capillary flow rate, by adjusting the back pressure regulator, to give the desired range. Select the desired scale of the NO_x analyzer and adjust the phototube high voltage supply to give the desired range.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases and the CO_2 analyzer with carbon dioxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the NO_x analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO and CO_2 analyzers with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgment in selecting curves for data reduction.

(6) Check the NO_x to NO converter efficiency by the following procedure:

(i) Fill a new (not previously used to collect exhaust gas samples) sample bag with air (or oxygen) and NO span gas in proportions which result in a mix in the operating range of the analyzer. Provide enough oxygen for substantial conversion of NO to NO_2.

(ii) Knead bag and immediately connect the bag to the sample inlet and alternately measure the NO and NO_x concentration at 1-minute intervals by alternately passing the sample through the converter and the bypass (close valves N6 and N10 to minimize pump down rate of bag). After several minutes of operation, the recording of NO and NO_x will resemble Figure 1c if the converter is efficient. Even though the amount of NO_2 increases with time, the total NO_x ($NO+NO_2$) remains constant. A decay of NO_x with time indicates the converter is not essentially 100 percent efficient and the cause should be determined before the instrument is used.

(iii) The converter efficiency should be checked at least once weekly and preferably once daily.

(b) HC, CO, CO_2, and NO_x measurements: Allow a minimum of 20 minutes warmup for the HC analyzer and 2 hours for the CO, CO_2 and NO_x analyzers. (Power is normally left on infrared and chemiluminescence analyzers; but when not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply of the chemiluminescence analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after tests.

(2) Introduce span gases and set the CO and CO_2 analyzer gains, the HC analyzer sample capillary flow rate and the NO_x analyzer high voltage supply to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO or CO_2 analyzers, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in subparagraphs (1) and (2) of this paragraph if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, CO_2, and NO_x concentrations of samples. Care should be exercised to prevent moisture from condensing in the sample collection bag.

(6) Check zero and span points.

(c) For the purposes of this section, the term "zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

11. Section 1201.85 is revised to read as follows:

§ 1201.85 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours before the cold start exhaust emission test, at an ambient temperature as specified in

§§ 1201.73 and 1201.74. The vehicle shall be stored prior to the emission tests in such a manner that precipitation (e.g. rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles and simulates a hot start drive of 7.5 miles. The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The first period, representing the hot start "transient" phase, terminates at the same point in the driving schedule as the first phase of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run. During the tests the ambient temperature shall be between 68° F. and 86° F.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and start the cooling fan.

(3) With the sample solenoid valves in the "dump" position connect evacuated sample collection bags to the two dilute exhaust sample connectors and the dilution air sample line connector.

(4) Start the positive displacement pump, the sample pumps and the temperature recorder. (The heat exchanger of the constant volume sampler should be preheated to its operating temperature before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 10 c.f.h.) and set the revolution counters to zero.

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Simultaneously start the revolution counter for the positive displacement pump, position the sample solenoid valves to direct the sample flows into the "transient" exhaust sample bag and the dilution air sample bag, and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule (§ 1201.75).

(11) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the dilute exhaust sample flow from the "transient" bag to the "stabilized" bag, switch off revolution counter No. 1 and start counter No. 2. Immediately disconnect the "transient" sample bag, transfer to the analytical system and process according to § 1201.84 as soon as practical and in no case longer than 10 minutes after the end of this portion of the test.

(12) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(13) Five seconds after the engine stops running, simultaneously turn off revolution counter No. 2 and position the sample solenoid valve to the "dump" position. Immediately disconnect the "stabilized" exhaust and dilution air sample bags, transfer to analytical system and process samples according to § 1201.84 as soon as practicable and in no case longer than 10 minutes after the end of this portion of the dynamometer test.

(14) Immediately after the end of the sample period, disconnect the exhaust tube from the tailpipe(s), turn off the cooling fan and close the engine compartment cover.

(15) Turn off the positive displacement pump.

(16) Repeat the steps in subparagraphs (2) through (10) of this paragraph for the hot start test except only one evacuated sample bag is required for sampling exhaust gas. The step in subparagraph (7) of this paragraph shall begin 9 and 11 minutes after the end of the sample period for the cold start test.

(17) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off the No. 1 revolution counter and position the sample solenoid valve to the "dump" position. (Engine shutdown is not part of the hot start test sample period.)

(18) Immediately disconnect the "transient" exhaust and dilution air sample bags, transfer to analytical system and process samples according to § 1201.84 as soon as practicable and in no case longer than 10 minutes after the end of this portion of the dynamometer test.

(19) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(20) Turn off the positive displacement pump.

12. Section 1201.86 is revised to read as follows:

§ 1201.86 Chart reading.

(a) Determine the HC, CO, CO_2 and NO_x concentrations of the dilution air and dilute exhaust sample bags from the instrument deflections or recordings making use of appropriate calibration charts.

(b) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if a recorder is used.

13. Section 1201.87 is revised to read as follows:

§ 1201.87 Calculations (exhaust emissions).

The final reported test results shall be computed by use of the following formulae:

(a) For light duty vehicles:

$$Y_{wm} = (0.43\ Y_{ct} + 0.57\ Y_{ht} + Y_s)/7.5$$

where:

Y_{wm} = Weighted mass emissions of each pollutant, i.e. HC, CO, or NO_x, in grams per vehicle mile.

Y_{ct} = Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

Y_{ht} = Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

Y_s = Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon Mass:

$$HC_{mass} = V_{mix} \times Density_{HC} \times \frac{HC_{conc}}{1{,}000{,}000}$$

(2) Oxides of nitrogen Mass:

$$NO_{x_{mass}} = V_{mix} \times Density_{NO_2} \times \frac{NO_{x_{conc}}}{1{,}000{,}000} \times K_H$$

(3) Carbon monoxide Mass:

$$CO_{mass} = V_{mix} \times Density_{CO} \times \frac{CO_{conc}}{1{,}000{,}000}$$

(c) Meaning of symbols:

HC_{mass} = Hydrocarbon emissions, in grams per test phase.

$Density_{HC}$ = Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (16.33 gm./cu. ft.).

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in p.p.m. carbon equivalent, i.e. equivalent propane × 3.

$$HC_{conc} = HC_e - HC_d\ (1 - 1/DF)$$

where:

HC_e = Hydrocarbon concentration of the dilute exhaust sample as measured, in p.p.m. carbon equivalent.

HC_d = Hydrocarbon concentration of the dilution air as measured, in p.p.m. carbon equivalent.

$NO_{x_{mass}}$ = Oxides of nitrogen emissions, in grams per test phase.

$Density_{NO_2}$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (54.16 gm./cu. ft.).

$NO_{x_{conc}}$ = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in p.p.m.

$$NO_{x_{conc}} = NO_{x_e} - NO_{x_d}\ (1 - 1/DF)$$

where:

NO_{x_e} = Oxides of nitrogen concentration of the dilute exhaust sample as measured, in p.p.m.

NO_{x_d} = Oxides of nitrogen concentration of the dilution air as measured, in p.p.m.

CO_{mass} = Carbon monoxide emissions, in grams per test phase.

$Density_{CO}$ = Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 gm./cu. ft.).

CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor and CO_2 extraction, in p.p.m.

$$CO_{conc} = CO_e - CO_d\ (1 - 1/DF)$$

where:

CO_e = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in p.p.m. The calculation assumes the hydrogen = carbon ratio of the fuel is 1.85:1.

$$CO_e = (1 - 0.01925\ CO_{2_e} - 0.000323\ R)\ CO_{e_m}$$

where:

CO_{e_m} = Carbon monoxide concentration of the dilute exhaust sample as measured, in p.p.m.

CO_{2_e} = Carbon dioxide concentration of the dilute exhaust sample, in mole percent.

R = Relative humidity of the dilution air, in percent.

CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in p.p.m.

$$CO_d = (1 - 0.000323\ R)\ CO_{d_m}$$

where:

CO_{d_m} = Carbon monoxide concentration of the dilution air sample as measured, in p.p.m.

$$DF = \frac{13.4}{CO_{2_e} + (HC_e + CO_e) \times 10^{-4}}$$

V_{mix} = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R and 760 mm. Hg).

$$V_{mix} = V_o \times N\ (P_p/760\text{ mm. Hg})\ (528°R/T_p)$$

where:

V_o = Volume of gas pumped by the positive displacement pump, in cubic cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

P_p = Absolute pressure of the dilute exhaust entering the positive displacement pump, in mm. HG, i.e. barometric pressure minus the pressure depression below atmospheric of the mixture entering the positive displacement pump.

T_p = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

K_H = Humidity correction factor.

$$K_H = \frac{1}{1 - 0.0047\ (H - 75)}$$

where:

H = Absolute humidity in grains of water per pound of dry air.

(d) Example calculation of mass emission values:

(1) For the "transient" phase of the cold start test assume $V_o = 0.29344$ cu. ft. per revolution; N = 10,485; R = 48 percent; H = 62 grains per pound of dry air; $P_p = 692$ mm. Hg; $T_p = 570°R$; $HC_e = 105.8$ p.p.m. carbon equivalent; $NO_{x_e} = 11.2$ p.p.m.; $CO_{e_m} = 306.6$ p.p.m.; $CO_{2_e} = 1.43$ percent; $HC_d = 12.1$ p.p.m.; $NO_{x_d} = 0.8$ p.p.m.; $CO_{d_m} = 15.3$ p.p.m.

Then:

$$V_{mix} = (0.29344)\ (10{,}485)\ (692/760)\ (528/570) = 2595.0 \text{ cu. ft. per test phase.}$$

$$K_H = \frac{1}{1 - 0.0047\ (62 - 75)} = 0.9424$$

$$CO_e = (1 - 0.01925(1.43) - 0.000323(48))\ 306.6 = 293.4 \text{ p p.m.}$$

$$CO_d = (1 - 0.000323(48))\ 15.3 = 15.1 \text{ p.p.m.}$$

$$DF = \frac{13.4}{1.43 + (105.8 + 293.4) \times 10^{-4}} = 9.116$$

$$HC_{conc} = 105.8 - 12.1\ (1 - 1/9.116) = 95.03$$

$$HC_{mass} = (2595)\ (16.33)\ (95.03/1{,}000{,}000) = 4.027 \text{ grams per test phase.}$$

$$NO_{x_{conc}} = 11.2 - 0.8\ (1 - 1/9.116) = 10.49$$

$$NO_{x_{mass}} = (2595)\ (54.16)\ (10.49/1{,}000{,}000)\ (0.9424) = 1.389 \text{ grams per test phase.}$$

$$CO_{conc} = 293.4 - 15.3\ (1 - 1/9.116) = 279.8$$

$$CO_{mass} = (2595)\ (32.97)\ (279.8/1{,}000{,}000) = 23.94 \text{ grams per test phase.}$$

(2) For the "stabilized" portion of the cold start test assume that similar calculations resulted in $HC_{mass} = 0.62$ grams per test phase; $NO_{x_{mass}} = 1.27$ grams per test phase; and $CO_{mass} = 5.98$ grams per test phase.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in $HC_{mass} = 0.51$ grams per test phase; $NO_{x_{mass}} = 1.38$ grams per test phase; and $CO_{mass} = 5.01$ grams per test phase.

(4) For a 1975 light duty vehicle:

$$HC_{wm} = ((0.43)\ (4.027) + (0.57)\ (0.51) + 0.62)/7.5 = 0.352 \text{ gram per vehicle mile.}$$

$$NO_{x_{wm}} = ((0.43)\ (1.389) + (0.57)\ (1.38) + 1.27)/7.5 = 0.354 \text{ gram per vehicle mile.}$$

$$CO_{wm} = ((0.43)\ (23.94) + (0.57)\ (5.01) + 5.98)/7.5 = 2.55 \text{ grams per vehicle mile.}$$

[FR Doc.71-9308 Filed 7-1-71;8:45 am]

Proposed Rule Making

ENVIRONMENTAL PROTECTION AGENCY

[45 CFR Part 1201]

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Proposed Standards and Test Procedures Applicable to 1973 and 1974 Light-Duty Vehicles

In conjunction with a review of comments on the proposed 1975 light-duty vehicle emission standards and test procedures (36 F.R. 3528 and 36 F.R. 9469), a study was made of air quality data to determine the proper hot-start-to-cold-start weighing for the test procedures.

It was determined that a weighing different from that reflected in the proposal would better represent emissions that should be measured to meet air quality requirements. Accordingly, the test procedures applicable to 1975 and subsequent model year vehicles, published in this issue of the FEDERAL REGISTER, are modified in this regard.

It appears desirable to make the revised 1975 test procedures applicable to earlier model years. However, because there may be objections regarding the leadtime involved in applying the revised procedures to the 1973 and 1974 model years, it would be inappropriate to make this change without providing an opportunity for comment. Therefore, the test procedures proposed for applicability to the 1973 and 1974 model years (36 F.R. 3825) are being adopted in this issue of the FEDERAL REGISTER without a change in hot-start-to-cold-start weighting.

Notice is hereby given that the Administrator is considering making the Federal test procedures promulgated for applicability to 1975 and later model years applicable to the 1973 and 1974 model years as well. The standards for those years would be adjusted as follows to reflect the same degree of stringency as the standards which have today been adopted for those years:

1. Hydrocarbons—3.0 grams per vehicle mile.

2. Carbon monoxide—28.0 grams per vehicle mile.

3. Oxides of Nitrogen—3.1 grams per vehicle mile.

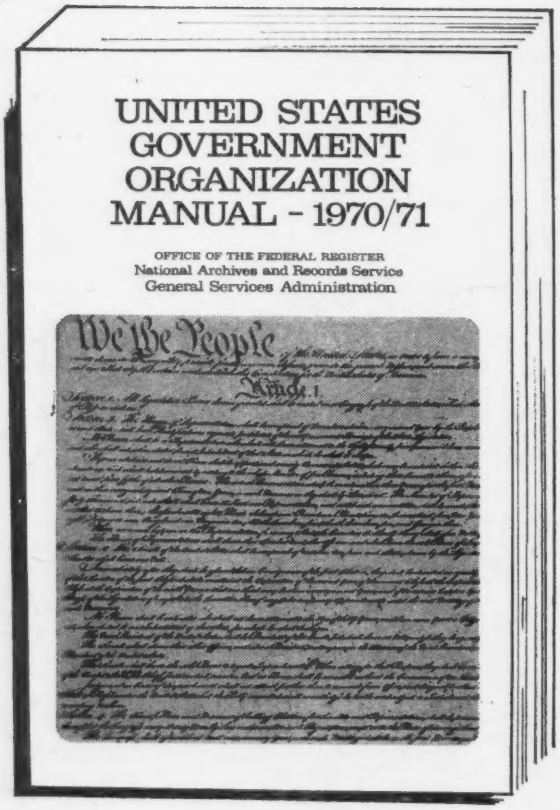
Interested persons may submit written data, views, or arguments (in quadruplicate) in regard to the proposed regulations to the Administrator, Environmental Protection Agency, Attention: Office of Air Programs, Parklawn Building, 5600 Fishers Lane, Rockville, MD 20852. All relevant material received not later than 60 days after the publication of this notice will be considered. This notice of proposed rule making is issued under the authority of section 202, Public Law 91-604 (sec. 6, 84 Stat. 1690).

Dated: June 23, 1971.

WILLIAM D. RUCKELSHAUS,
Administrator.

[FR Doc.71-9309 Filed 7-1-71;8:45 am]

know your government



UNITED STATES GOVERNMENT ORGANIZATION MANUAL 1970/71

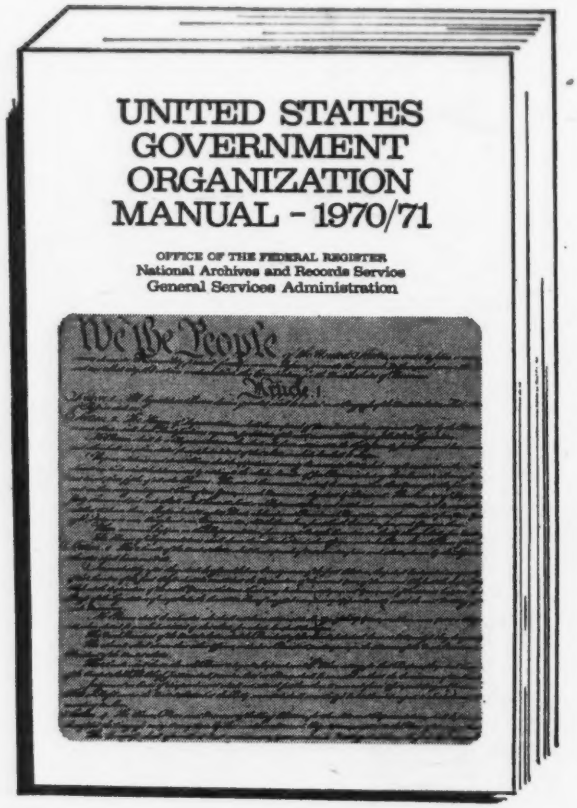
presents essential information about Government agencies (updated and republished annually). Describes the creation and authority, organization, and functions of the agencies in the legislative, judicial, and executive branches. This handbook is an indispensable reference tool for teachers, students, librarians, researchers, businessmen, and lawyers who need current official information about the U.S. Government. The United States Government Organization Manual is the official guide to the functions of the Federal Government, published by the Office of the Federal Register, GSA.

$3.00 per copy. Paperbound, with charts

Order from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

DTC

know your government



UNITED STATES GOVERNMENT ORGANIZATION MANUAL 1970/71

presents essential information about Government agencies (updated and republished annually). Describes the creation and authority, organization, and functions of the agencies in the legislative, judicial, and executive branches. This handbook is an indispensable reference tool for teachers, students, librarians, researchers, businessmen, and lawyers who need current official information about the U.S. Government. The United States Government Organization Manual is the official guide to the functions of the Federal Government, published by the Office of the Federal Register, GSA.

$3.00 per copy. Paperbound, with charts

Order from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402